Liebert® APS ™

GUIDE SPECIFICATIONS
5 to 20kVA (200-240V; 200/100-240/120V)
Single - Phase Uninterruptible Power Supply System

GENERAL

1.1 SUMMARY

This specification describes the Liebert APS UPS, a modular, uninterruptible power supply system for workstation, server, network, telecom and other sensitive electronic equipment applications. It defines the electrical and mechanical characteristics and requirements for a continuous-duty, single-phase, solid-state, uninterruptible power supply system. The uninterruptible power supply system, hereafter referred to as the UPS, shall provide high-quality AC power.

1.2 STANDARDS

The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.

- UL Standard 1778 4th Edition
- CSA 22.2, No. 107.1
- IEC/EN/AS 62040-1:2008
- FCC Part 15, Sub Part B, Class A
- IEC/EN/AS 62040-2 Cat 2
- CISPR22 Class A
- IEEE C62.41, Category A Level 3
- IEC/EN/AS 61000-4-2, 3, 4, 5, 6
- National Electrical Code (NFPA 70)
- NEMA PE-l
- OSHA
- ASME
- ISTA-1A / 1B / 1E
- WEEE
- RoHS2 (6 by 6)
- REACH Compliant
- UPS classification according to IEC EN 62040-3 shall be VFI-SS-111

1.3 SYSTEM DESCRIPTION

1.3.1 General

The Liebert APS UPS system shall consist of the appropriate number of modules for capacity and/or redundancy. All modules shall operate simultaneously and share the load. In a non-redundant system, all the modules making up the UPS shall be required to supply the full, rated load. If a module should malfunction, the load shall be transferred automatically to the bypass line. If a battery module should malfunction, it shall be isolated from the system, resulting in reduced backup time. For redundant operation, the UPS shall have one or more modules more than what shall be required to supply the full, rated load. The malfunction of one of the modules shall cause that module to be isolated from the system and the remaining module(s) shall continue to carry the load. Replacement of a module shall be possible without disturbance to the connected load.

1.3.2 Modes of Operation

The UPS shall be designed to operate as a true on-line system in the following modes:

A. Normal—The critical AC load shall be continuously supplied by the UPS inverter. The power module rectifiers derive power from a utility AC source and supply regulated DC power to the inverter. The module's inverter regenerates precise AC power to supply the connected equipment. The battery charger shall be in the power module and maintain a float-charge on the batteries of the UPS; additionally, the optional charger module shall also be used to maintain a quicker recharge time for long backup time applications.

B. Backup—Upon failure of utility AC power, the critical AC load shall be supplied by the inverter, which obtains power from the battery system. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.

C. Recharge—Upon restoration of utility AC power, after a utility AC power outage, the input converter shall automatically restart and resume supplying power to the inverter. Also the battery charger shall begin to recharge the battery system.

D. Automatic Restart—Upon restoration of utility AC power, after a utility AC power outage and complete battery discharge, the UPS shall automatically restart and resume supplying power to the critical load. Also the battery charger shall automatically recharge the battery. This feature shall be enabled from the factory and shall be capable of being disabled by the user. The user shall also be able to program two auto restart delay settings.

- Battery capacity % level
- Countdown timer

E. Bypass—The bypass shall provide an alternate path for power to the critical load that shall be capable of operating in the following manner:

- Automatic—In the event of an internal failure or should the inverter overload capacity be exceeded, the UPS shall perform an automatic transfer of the critical AC load from the inverter to the bypass source.
- Manual—Should the UPS need to be taken out of service for limited maintenance or repair, manual activation of the bypass shall cause an immediate transfer of the critical AC load from the inverter to the bypass source.

1.3.3 Performance Requirements

1.3.3.1 System

A. Configuration—Select UPS systems shall be configured or upgradeable to power ratings as follows: (select one)

15kVA rated, 10-Bay Frame Transformer-Free Systems

- 5kVA non-redundant to 5kVA redundant systems or to 10 or 15kVA non-redundant or redundant systems
- 10kVA non-redundant to 10kVA redundant systems or to 15kVA non-redundant or redundant systems
- 15kVA non-redundant to 15kVA redundant systems

15kVA rated, 12-Bay Frame Transformer-Based Systems

- 5kVA non-redundant to 5kVA redundant systems or to 10 or 15 kVA non-redundant or redundant systems
- 10kVA non-redundant to 10kVA redundant systems or to 15kVA non-redundant or redundant systems
- 15kVA non-redundant to 15kVA redundant systems

20kVA rated, 16-Bay Frame Transformer-Free Systems

- 5kVA non-redundant to 5kVA redundant systems or to 10, 15 or 20kVA non-redundant or redundant systems
- 10kVA non-redundant to 10kVA redundant systems or to 15 or 20kVA non-redundant or redundant systems
- 15kVA non-redundant to 15kVA redundant systems or to 20kVA non-redundant or redundant systems
- 20kVA non-redundant to 20kVA redundant systems

20kVA rated, 16-Bay Frame Transformer-Based Systems

- 5kVA non-redundant to 5kVA redundant systems or to 10, 15 or 20kVA non-redundant or redundant systems
- 10kVA non-redundant to 10kVA redundant systems or to 15 or 20kVA non-redundant or redundant systems
- 15kVA non-redundant to 15kVA redundant systems or to 20kVA non-redundant or redundant systems
- 20kVA non-redundant to 20kVA redundant systems

B. Isolation (Only for transformer-based systems)

Input to output isolation shall be provided, via the output transformer, regardless of operating mode. (UPS or bypass)

C. Remote Stop

The UPS shall provide provisions for remote stop capability, both N.O. and N.C. system compatible.

D. Energy Star Qualified

The following systems shall be EPA Energy Star qualified (select one)

15kVA rated, 10-Bay Frame Transformer-Free Systems

- 5, 10 or 15 kVA non-redundant or redundant systems

15kVA rated, 12-Bay Frame Transformer-Based Systems

- 10 or 15 kVA non-redundant or redundant systems

20kVA rated, 16-Bay Frame Transformer-Free Systems

- 5, 10, 15 or 20 kVA non-redundant or redundant systems

20kVA rated, 16-Bay Frame Transformer-Based Systems

- 10, 15 or 20 kVA non-redundant or redundant systems

1.3.3.2 AC Input to UPS

A. Voltage Configuration: (select one)

- 200, 208, 220, 230, 240VAC nominal, single-phase, 2-wire-plus-ground (L-L-G or L-N-G) (select for any frame listed above)
- 380/400/415/200/100, 208/120, 220/110, 230/115, 240/120VAC nominal, single-phase, 3-wire-plus-ground. (select for transformer-free frames listed above)

B. Frequency: 40 to 70 Hz.

C. Input Current Distortion: 5% THD maximum at full load.

D. Input Power Factor: 0.99 lagging at 100% rated load.

E. Inrush Current: 150% of full load input current maximum for 3 cycles.

F. Surge Protection: Sustains input surges without damage per criteria listed in IEEE C62.41, Category A, Level 3 and IEC/EN/AS 61000-4-2, 3, 4, 5, 6 Category 2, Table 6.

1.3.3.3 AC Output

A. Voltage Configuration: (select one)

- 200, 208, 220, 230, 240VAC nominal, single-phase, 2-wire-plus-ground (L-L-G or L-N-G) (select for transformer-free frames listed above)
- 200/100, 208/120, 220/110, 230/115, 240/120VAC nominal, single-phase, 3-wire-plus-ground. (L-L-N-G) (select for any frame listed above)

  Output voltage shall be field configurable.

B. Voltage Regulation: ± 3% steady state.

C. Frequency Regulation: 50 or 60 Hz, ± 0.2 Hz.

D. Frequency Slew Rate: 0.3 Hz per second maximum.

E. Bypass Frequency Synchronization Range: ± 3.5 Hz.

F. (Select for transformer-free systems)

Voltage Distortion: 3% total harmonic distortion (THD) maximum into a 100% linear load, 5% THD maximum into a 100% non-linear load with crest factor ratio of 3:1.

(Select for transformer-based systems)

Voltage Distortion: 3% total harmonic distortion (THD) maximum into a 100% linear load, 7% THD maximum into a 100% non-linear load with crest factor ratio of 3:1.

G. Load Power Factor Range: 0.65 lagging to 0.90 leading.

H. Output Power Rating: Rated kVA at: 0.9 lagging power factor.

I. Overload Capability: >100% - 104% indefinitely, 105% - 130% for 1 minute, 131% - 150% for 10 seconds, 151% - 200% for 1 second, >201% for 250 msec, The load shall be transferred to bypass when any of the above conditions shall be exceeded. A short circuit shall cause an immediate system shutdown.

J. Voltage Transient Response: ± 7% maximum for any load step up to and including 100% of the UPS rating.

K. Transient Recovery Time: To within 1% of steady state output voltage within 60 milliseconds.

1.3.3.4 Batteries

A. Internal Battery: The battery shall consist of gas recombination, valve regulated, lead acid cells. Flame retardant batteries shall be provided, which render the UPS suitable for installation inside a computer room per requirements of UL Standard 1778 and NFPA70.

B. Reserve Time: (with ambient temperature between 20 and 25°C [68 and 77°F]). The UPS shall contain an internal battery system to provide a reserve time of 5 minutes at 100% load with an equal number of power and battery strings fitted. The UPS shall contain provisions to fit additional battery modules internally if space permits. The UPS shall also interface with an external battery cabinet to extend reserve time capabilities.

C. Battery Recharge: To prolong battery life, the UPS shall contain temperature-compensated battery charging. When equal numbers of power modules and battery strings shall be fitted, the battery charger shall be able to recharge a fully discharged battery system to 90% capacity in 5 hours at nominal input voltage and nominal ambient temperature. An optional charger module shall be available to provide a quick recharge time for systems with extended run time.

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient Temperature

- Operating: UPS 0°C to +40°C [32°F to 104°F]; battery 20°C to 25°C [68°F to 77°F] for optimum performance.
- Storage: UPS -20°C to +60°C [-4°F to 140°F]; battery -20°C to 25°C [-4°F to 77°F]for a maximum of 6 months.

B. Relative Humidity

- Operating: 0 to 95% non-condensing.
- Storage: 0 to 95% non-condensing.

C. Altitude

- Operating: To 3000 meters (10,000 feet). Derating or reduced operating temperature range required for higher altitudes.
- Storage: To 10,000 meters (30,000 feet).

D. Audible Noise

Noise generated by the UPS during normal operation shall not exceed 55 dBA for output loading of <50%; 65 dBA for output loading of 51-100%, measured at 1 meter from the surface of the UPS

E. Electrostatic Discharge

The UPS shall be able to withstand a 4 kV contact, 8 kV air electrostatic discharge without damage and shall not affect the critical load. These limits shall be per Standard IEC 62040-4-2 2nd Edition, Cat 2, Table 6 and IEC 61000-4-2.

1.5 USER DOCUMENTATION

The specified UPS system shall be supplied with one (1) user's manual. Manuals shall include installation instructions with illustrations, a functional description of the equipment with block diagrams, safety precautions, illustrations, step by step operating procedures, troubleshooting assistance and routine maintenance guidelines.

1.6 WARRANTY

The UPS manufacturer shall warrant the UPS against defects in materials and workmanship for two (2) years. The warranty shall cover all parts for two (2) years and onsite labor for ninety (90) days. With startup provided by Liebert Services, the warranty shall cover all parts and onsite labor for two (2) years. Maintenance contract packages shall also be available.

1.7 QUALITY ASSURANCE

1.7.1 Manufacturer’s Qualifications

A minimum of 30 years experience in the design, manufacture and testing of solid-state UPS systems shall be required.

1.7.2 Factory Testing

Before shipment, the manufacturer shall fully and completely test the configured system to assure compliance with the specification. These tests shall include operational discharge and recharge tests on the internal battery to guarantee rated performance. A hard copy test report shall be included at no additional cost with every unit.

2.0 PRODUCT

2.1 FABRICATION

All materials and components making up the UPS shall be new, of current manufacture and shall not have been in prior service except as required during factory testing. The UPS shall be constructed of replaceable subassemblies. All active electronic devices shall be solid-state.

2.1.1 Wiring

Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (NFPA 70) and other applicable codes and standards.

2.1.2 Cabinet

The UPS unit comprised of: power module, battery module, control module, system interconnect module and user interface module shall be housed in a single free-standing enclosure and meet the requirements of IP20. The UPS system shall be designed such that the battery modules may be installed into any module bay in the cabinet and power modules into any module bay in the top portion of the cabinet. The UPS cabinet shall be cleaned, primed and painted with the manufacturer's standard color. Casters and leveling feet shall be provided.

UPS cabinet dimensions shall not exceed (select one)

10-bay Frame / 15kVA rated Transformer-Free Systems

440mm W x 800 mm D x 695 mm H (17 in W x 32 in D x 27 in H)

12-bay Frame / 15kVA rated Transformer-Based Systems

440mm W x 800 mm D x 1060 mm H (17 in W x 32 in D x 42 in H)

16-bay Frame / 20kVA rated Transformer-Free Systems

440mm W x 850 mm D x 970 mm H (17 in W x 34 in D x 38 in H)

16-bay Frame /20kVA rated Transformer-Based Systems

440mm W x 850 mm D x 1240 mm H (17 in W x 34 in D x 49 in H)

Additionally the 15 and 20kVA rated transformer-free and 15kVA rated transformer-based frames shall be capable of being installed in a standard 600mm wide (24 in) four post rack enclosure with the optional rack-mount kit.

2.1.3 Cooling

The UPS shall be forced air cooled by internally mounted fans. Air intake shall be from the front, and exhaust out shall be from the rear of the unit. Air intake shall contain air filters with a PPI = 30 rating.

2.2 COMPONENTS

2.2.1 Input Converter

A. General

Incoming AC power shall be converted to a regulated DC output by the input converter for supplying DC power to the inverter. The input converter shall provide input power factor and input current distortion correction.

B. AC Input Current Limit

The input converter shall be provided with AC input over current protection.

C. Input Protection

The UPS shall have built-in protection against undervoltage, overcurrent and overvoltage conditions including low-energy surges introduced on the primary AC source and the bypass source. The UPS shall sustain input surges without damage per criteria listed in IEEE C62.41, Category A, Level 3 and IEC/EN/AS 61000-4-2, 3, 4, 5, 6 Category 2, Table 6. The UPS cabinet shall contain an input breaker sized to supply full rated load and to recharge the battery at the same time.

D. Battery Recharge

To prolong battery life, the UPS shall contain temperature-compensated battery charging. When an equal number of power modules and battery strings shall be fitted, the battery charger shall be able to recharge the internal batteries to 90% capacity in 5 hours at nominal input voltage and nominal ambient temperature.

E. Charger Output Filter

The battery charger shall have an output filter to minimize ripple current into the battery.

2.2.2 Inverter

A. General

The inverter shall convert DC power from the input converter output or the battery, into precise regulated sine wave AC power for supporting the critical AC load.

B. Overload

The inverter shall be capable of supplying current and voltage for overloads exceeding 100% and up to 200% of full load current. A visual indicator and audible alarm shall indicate overload operation. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control logic shall sense and disconnect the inverter from the critical AC load without requiring clear protective fuses. The load shall be transferred to bypass when any of the above conditions are exceeded.

C. Maximum Load Alarm

The user shall be able to set the alarm point to a value of less than 100% rating so that the UPS shall alarm before an overload condition or loss of redundancy is reached.

D. Output Frequency

The output frequency of the inverter shall be controlled by an oscillator. The oscillator shall hold the inverter output frequency to ± 0.2 Hz for steady state and transient conditions. The inverter shall track the bypass continuously, providing the bypass source maintains a frequency within the user selected synchronization range. If the bypass source fails to remain within the selected range, the inverter shall revert to the internal oscillator.

E. Output Protection

The UPS inverter shall employ electronic current limiting.

F. Battery over Discharge Protection

To prevent battery damage from over discharging, the UPS control logic shall control the shutdown voltage setpoint. This point shall be dependent on the rate of discharge.

2.2.3 Display and Controls

A. General

The front panel shall consist of multiple status LEDs, switches and a 320x240 dot matrix LCD display for additional alarm/configuration information. All mimic display LEDs shall indicate the following:

- AC Input
- On Battery
- Load On/Off
- On Inverter
- On Bypass

The UPS fault indicator shall be used with additional indicators and audible alarms to notify the user that a UPS fault condition has occurred. The color of the fault indicator LED shall be red.

- Replace Battery Module
- Replace Power Module
- Replace Control Module
- On Bypass
- Low Battery
- OverTemp Warning
- UPS Shutdown

If there is a fault condition, the UPS shall attempt to maintain conditioned power to the load or at minimum transfer to bypass.

There shall also be indication on each module should the module fail and need to be replaced.

In addition to a visual fault signal, the UPS shall also record fault occurrences in a rolling event log. The event log on the standard unit shall record up to 1024 occurrences, with the oldest events discarded first. The user shall have access to the event log through the LCD display. Every alarm and/or event recorded in the event log shall contain a time and date stamp.

B. Audible Alarms

The volume of all audible alarms shall be at least 65dBA at a distance of one meter (three feet). An audible alarm shall be used in conjunction with the LED/LCD indication to indicate a change in UPS status.

The audible alarms shall annunciate for utility line loss, low battery (while on battery) and all other alarm conditions. For all alarm conditions, the user must look at the display to determine the cause of error/alarm. All alarm tones shall be a continual tone until the condition rectifies itself or the alarm shall be silenced. Once silenced, the audible alarm shall not sound until a new alarm condition shall be present.

C. Alarm Silence Button

In addition to the load on/off switch, the user interface shall include an audible ‘Alarm Silence’ switch. If the alarm silence switch shall be pressed for one second, all current audible alarms shall be disabled. If a new alarm occurs or if a canceled alarm condition disappears and then re-appears, the audible alarm shall be re-enabled.

D. Liquid Crystal Display (LCD)

The LCD shall be used to provide information to the user. The display shall also be used to program ALL information (voltage, frequency, etc.) into the UPS. The LCD shall be multilingual with seven languages (English, French, Italian, German, Spanish, Chinese and Russian).

2.2.4 Automatic Battery Test

The UPS shall initiate an automatic battery testing sequence periodically, at a programmed day and time of day, selectable by the end user. The user shall be able to select the interval of the battery test and shall be able to select 8-, 12-, 16-, 20- or 26-week intervals or shall be able to disable the automatic battery test.

Should a battery failure occur, the UPS shall immediately return to normal mode and fault signals (visual, audible and remote via serial) shall be communicated. No audible or remote (via serial/contact closures) indication of the battery test shall be communicated during the automatic battery test.

The automatic battery test factory default settings shall be enabled at an 8-week interval and occur on Wednesdays at 0600 hours (based on the 24 hour clock).

2.2.5 Remote Emergency Power Off (REPO)

The remote emergency power off function (REPO) shall allow the user to disable all UPS outputs in an emergency situation. The REPO, in order to be flexible, shall be able to interface with either normally open (N.O.) or normally closed (N.C.) systems. The REPO shall be activated when a pair of Safety Extra Low Voltage (SELV) contacts, external to the UPS, shall be activated. The REPO connection shall be through a simple terminal block type connector.

The REPO function shall not operate if the UPS manual bypass switch is in the bypass position. The user shall also supply a means of interfacing with the REPO circuit to allow disconnecting the UPS input feeder breaker to remove all sources of power to the UPS and the connected equipment to comply with local wiring codes/regulations.

Regardless of the UPS mode of operation when the REPO is activated, the UPS output shall not be re-enabled until the following occurs:

- REPO contacts are reset (closed if N.C. contacts are used and open if N.O. contacts are used)
- Input circuit breaker is closed
- Control enable switch is turned On
- User interface On/Off switch is depressed

2.2.6 Bypass

A. General

A bypass circuit shall be provided as an integral part of the UPS. The bypass shall have an overload rating of 300% rated full load for 10 cycles and 1000% for subcycle fault clearing. The bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide a transfer of the load to the bypass source, without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS.

B. Automatic Transfers

The transfer control logic shall automatically activate the bypass, transferring the critical AC load to the bypass source, after the transfer logic senses one of the following conditions:

- Inverter overload capacity exceeded
- Inverter overtemperature
- UPS fault condition

For inverter overload conditions, the transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if one of the following conditions exists:

- Inverter/Bypass voltage difference exceeds preset limits (+10%, -15% of nominal)
- Bypass frequency out of preset limits (±5Hz of nominal frequency)

C. Automatic Retransfer

Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:

- Bypass out-of-synchronization range with inverter output
- Overload condition exists in excess of inverter full load rating
- UPS fault condition present

D. Manual Transfer

In addition to the internal bypass function, the UPS shall have a manual bypass function. The manual bypass function shall be provided by a switch mounted on the bottom-front of the UPS. Removal of the lower front bezel shall be required for access. The actual AC break time between inverter and bypass shall be less than 4 milliseconds.

The manual bypass shall also be a partial "wrap-around" bypass and shall be configured to wrap around the rectifier, battery charger, inverter and battery in the same manner as the automatic bypass. The manual bypass shall not wrap around the EMI filtering, overcurrent protection or isolation transformer.

The UPS shall initiate an audible alarm upon transfer to manual bypass. The user shall be able to silence the audible alarm. The alarm shall continue to sound (unless silenced) while in bypass mode. This shall provide a reminder to the user that the load continues to be powered from utility supply alone.

2.3 COMMUNICATIONS

The UPS shall allow for flexibility in communication. The UPS shall be able to communicate through all communication ports simultaneously; the media of either communications port may change without affecting the operation of the UPS. The use of relay contacts shall not affect the operation of the communications ports.

2.3.1 Relay Contacts

The relay contacts shall be available through the terminal block connector and shall be compatible with the Liebert MultiLink® shutdown software. The UPS shall indicate via relay contact closure the following information:

- Low Battery
- On Battery

Relay contacts shall be rated 24VDC, 0.3 A. Additional signals (such as on bypass and summary alarm) shall be provided by an Liebert IntelliSlot® relay card option.

The following terminal block pins shall be:

Position	Name	Description
1	Battery Mode	Output dry contact of battery mode operation
2	Battery Mode	Output dry contact of battery mode operation
3	Low Battery	Output dry contact of low battery operation
4	Low Battery	Output dry contact of low battery operation
5	Any Mode Shut Down	Input dry contact of any mode shut down
6	GND	Any mode shutdown GND
7	Battery Mode Shut Down	Input dry contact of battery mode shut down
8	GND	Battery mode shutdown GND

2.3.2 Serial Communication

The UPS shall be able to communicate via a USB communication port for connection to a PC or server compatible with Liebert MultiLink® shutdown and monitoring software.

2.3.3 Network Communication

All models of the Liebert APS UPS product line shall have three Liebert IntelliSlot® ports standard. The UPS shall have be compatible with Emerson Network Power® Trellis™ DCIM software as well as LIFE service monitoring software as standard. The user shall have the option to have either one or two external protocols through the same Liebert IntelliSlot interface card to provide SNMP communication over a local area network or Modbus 485. 10/100Mbit Ethernet support shall be included.

2.4 ACCESSORIES (OPTIONAL COMPONENTS)

2.4.1 Non-Modular Battery Cabinets

The UPS shall have the capability to add third-party battery cabinets to the base UPS product. The connections between the UPS and the extended battery cabinets shall contain DC power only. All of these shall be able to be connected or disconnected safely by the user without interrupting power to the load. The UPS shall have a terminal block to allow connection of an optional temperature sensor in order to provide temperature compensated charging to prolong battery life.

2.4.2 Modular Battery Cabinets

The Modular Battery Cabinet shall be pre-configured with one to seven strings using Liebert APS Battery Modules installed. Each Extended Battery Cabinet shall include an External Battery Card (EBC) and two (2) communications cables. Each Extended Battery Cabinet shall communicate to the Liebert APS UPS for monitoring of the battery modules. A maximum of four modular Battery Cabinets shall be able to be used with each Liebert APS UPS.

2.4.3 Free-standing Maintenance Bypass Cabinet with Optional Distribution

The Maintenance Bypass Cabinet shall provide an external complete “wrap-around” protection and shall allow the Liebert APS UPS to be shut down for service without interrupting power to the connected equipment. The Maintenance Bypass Cabinet controls shall include a manual break before make bypass transfer switch, UPS input disconnect switch and a branch rated output circuit breaker. The Maintenance Bypass Cabinet controls shall be located behind a lockable front panel to provide operation security.

Maintenance Bypass Cabinet models shall be available with an isolation transformer in the bypass path. The Maintenance Bypass Cabinet shall be in a free standing enclosure.

Every Maintenance Bypass Cabinet model shall be able to be ordered with up to 10 output options. These options shall include receptacles as well as conduit fittings with branch-rated breakers. Each receptacle or conduit fitting shall include a power available indicator lamp.

2.4.4 Rack-Mount Maintenance Bypass Cabinet with Optional Distribution

The Maintenance Bypass Cabinet shall provide an external complete “wrap-around” protection and shall allow the Liebert APS UPS to be shut down for service without interrupting power to the connected equipment. The Maintenance Bypass Cabinet controls shall include a manual break-before-make bypass transfer switch, UPS input disconnect switch and a branch-rated output circuit breaker. The Maintenance Bypass Cabinet controls shall be located behind the front bezels.

Maintenance Bypass Cabinet models shall be in a rack-mount enclosure and every Maintenance Bypass Cabinet model shall be able to be ordered with up to two output POD options. These options shall include receptacles as well as individual branch-rated breakers.

3.0 FIELD SERVICES (OPTIONAL)

3.1 FIELD QUALITY CONTROL

The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup.

3.1.1 Visual Inspection

A. Inspect equipment for signs of shipping or installation damage.

B. Verify installation per drawings.

C. Inspect cabinets for foreign objects.

D. Verify neutral and ground conductors are properly sized and configured.

3.1.2 Mechanical Inspection

A. Verify all power modules are correctly fitted.

B. Verify all battery modules are correctly fitted.

C. Check all terminal screws, nuts and/or spade lugs for tightness.

3.1.3 Electrical Inspection

A. Confirm input voltage and phase rotation is correct.

B. Verify bypass voltage jumper is correct for voltages being used.

3.2 UNIT STARTUP AND SITE TESTING

The manufacturer's field service personnel shall provide site testing, if requested. Site testing shall consist of a complete test of the UPS and the associated accessories supplied by the manufacturer. A partial battery discharge test shall be provided as part of the standard startup procedure. The test results shall be documented, signed and dated for future reference.

3.3 MANUFACTURER'S FIELD SERVICE

3.3.1 Service Personnel

The UPS manufacturer shall directly employ a nationwide service organization, consisting of factory-trained Customer Engineers dedicated to the startup, maintenance and repair of UPS and power equipment. The organization shall consist of factory-trained Customer Engineers working out of District Offices in most major cities. An automated procedure shall be in place to ensure that the manufacturer dedicates the appropriate technical support resources to match escalating customer needs.

The manufacturer shall provide a fully automated national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours a day, 7 days a week and 365 days a year. If emergency service shall be required, call-back response time from a local Customer Engineer shall be 4 hours or less.

3.3.2 Replacement Parts Stocking

Parts shall be available through an extensive network to ensure around-the-clock parts availability throughout the country.

Local Customer Engineers shall stock replacement spare parts with backup available from District Service offices and the manufacturing location.

Customer Support Parts Coordinators shall be on-call 24 hours a day, 7 days a week, 365 days a year for immediate parts availability.

3.3.3 UPS Maintenance Training

Maintenance training courses for customer employees shall be available from the UPS manufacturer. This training shall be in addition to the basic operator training conducted as a part of the system startup.

The training course shall cover UPS theory, location of subassemblies, safety, battery considerations and UPS operational procedures. The course shall include AC-to-DC conversion and DC-to-AC inversion techniques, as well as control and metering. Troubleshooting and fault isolation using alarm information and internal self-diagnostics shall be stressed.

3.3.4 Maintenance Contracts

A complete offering of preventive and full-service maintenance contracts for both the UPS system and battery system shall be available. Warranty and preventive maintenance service shall be performed by factory trained Customer Engineers.

3.3.5 LIFE™ Technology Services

The UPS shall be “out of the box” enabled to interface with the LIFE™ Technology Service. LIFE™ Technology uses advanced service level data and IP-based communication to alert customer service personnel of potential issues that may impact the life of systems within the data center infrastructure. In the event of a failure, the response shall include the immediate dispatch of a service technician with detailed knowledge of the problem and the parts needed to fix it.